



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/636,105	08/07/2003	Wushing Yin	INDUM-110XX	9143

207 7590 11/04/2005

WEINGARTEN, SCHURGIN, GAGNEBIN & LEOVICI LLP
TEN POST OFFICE SQUARE
BOSTON, MA 02109

EXAMINER

NGUYEN, DONGHAI D

ART UNIT	PAPER NUMBER
----------	--------------

3729

DATE MAILED: 11/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/636,105

Applicant(s)

YIN ET AL.

Examiner

Donghai D. Nguyen

Art Unit

3729

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11/14/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) filed on 11/14/03 is being partially considered by the examiner. The reference 6,457,828 does not match to the listed inventor and the issues date. Therefore, the Examiner does not consider this reference.

Claim Objections

2. Claim 16 is objected to because it is duplicated of claim 15 and should be canceled. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-3, 5-20 and 28-30 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent 6,168,972 to Wang et al.

Regarding claims 1 and 2, Wang et al disclose a method for mating an integrated circuit device (200) having a plurality of conductive contacts (205) with contact tips arranged in a predetermined pattern and extending from one surface of said device (see Fig. 6A) to a substrate (300) having a plurality of conductive pads (305) arranged on one surface of said substrate in said predetermined pattern (see Fig. 7A), said method comprising the steps of: applying a layer

Art Unit: 3729

of a first underfill (filled underfill 210) to said surface of said device having said contacts extending therefrom (see Fig. 5B); partially curing said first underfill (see Col. 7, lines 4-7); applying a layer of a second underfill (310) to at least said conductive pads (305) of said substrate surface; aligning said device with said substrate such that said contacts are adjacent corresponding pads (Fig. 8A); and subjecting said device and said substrate to a reflow process to conductively couple said conductive contacts to said conductive pads (Fig. 8B and Col. 9, lines 7-10).

Regarding claim 3, Wang et al disclose applying at least one layer of said first underfill to said surface of said device having said contacts extending therefrom; and partially curing each of said at least one layer (Col. 10, lines 28-30).

Regarding claims 5-11, Figs. 5B-C show the removing said first underfill from said tips of said conductive contacts (205) by variety techniques such as: chemically mechanically polishing, reactively ion etching laser milling or ablating said layer of first underfill to expose said tips of said contacts (Col. 6, lines 61-63, Col. 7, lines 21-23, lines 59-61 and Col. 8, lines 4-6, etc.).

Regarding claim 12, Wang et al disclose the step of applying said layer of first underfill by at least one technique selected from the group of spinning, brushing, dispensing, spraying and screen printing (See Col. 5, lines 65-66).

Regarding claim 13, Wang et al disclose the step of partially curing said layer of first underfill utilizing a technique selected from the group of B-staging, soft baking, application of compressed gas, hot gas drying, oven heating, UV light curing and IR baking (see Col. 6, lines 1-12).

Regarding claims 14-17, Wang et al disclose the step of coating at least said pads with a fluxing/curing agent or a polymer flux (350 see Col. 10, lines 9-11).

Regarding claims 18, 19 and 28-30, Wang et al inherently disclose the second underfill with a filler load ranging from 0 to 30% by weight, from 0 to 10% by weight, less than 30% by weight, or less than 10% by weight since Wang et al do not mention of filler in the second underfill material, Examiner broadly considers the second underfill material of Wang et al contains 0% weight.

Regarding claim 20, Wang et al disclose the step of curing said first underfill and said second underfill (Col. 9, lines 25-30).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in view of US Patent 5,880,530 to Mashimoto et al.

Wang et al do not disclose at least one of said at least one layer of said first underfill is selected to reduce the coefficient of thermal expansion of the first underfill. Mashimoto et al teach the applying of two layers (40A and 40B) of underfill (40) having different coefficient of thermal expansion for reducing the stresses at the solder joints (Col. 3, line 63 to Col. 4, line 9). Therefore, it would have been obvious to one having ordinary skill in the art at the time the

Art Unit: 3729

invention was made to modify the Wang's method invention by the teaching of applying at least one of said at least one layer of said first underfill having different the coefficient of thermal expansion as taught by Mashimoto et for protecting and improving the solder joints/connections.

7. Claims 21-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al or in view of US Patent 5,933,713 to Farnworth.

Wang et al do not disclose the conductive contacts being reflowing by the process of applying hot gas or blowing air, etc. as recited in the above claims. However, these processes are conventional and well known in the art. Therefore, it would have been an obvious to one having ordinary skill in the art at the time the invention was made to utilize the process of applying forced hot gas, forced hot air to said device and said substrate to reflow said conductive contacts within an infra red oven, in a hot bar reflow process, in a hot plate reflow process, in a vapor phase reflow process or in a fume gas reflow process, etc. as so to form a solder joint by using the available techniques.

In additional, the Farnworth reference state that his solder connections can be reflowed by any suitable means listed in Col. 5, lines 37-50 including the above processes. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply any solder reflowed processes as taught by Farnworth onto the invention of Wang to form solder joints by reflowing the conductive contacts.

Conclusion

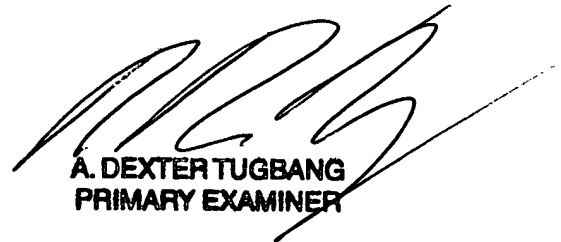
8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art of references cited for the teaching of encapsulating the semiconductor chips on PCB.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghai D. Nguyen whose telephone number is (571)-272-4566. The examiner can normally be reached on Monday-Friday (9:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter D. Vo can be reached on (571)-272-4690. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DN
August 3, 2005


A. DEXTER TUGBANG
PRIMARY EXAMINER